

WHAT IS CLAIMED IS:

1. A silicon-based film comprising a crystal phase formed on a substrate with a surface shape represented by a function f , wherein the silicon-based film is formed on a substrate with a surface shape having a standard deviation of an inclination $\arctan (df/dx)$ from 15° to 55° within the range of a sampling length dx from 20 nm to 100 nm, a Raman scattering strength resulting from an amorphous component in the silicon-based film is not more than a Raman scattering strength resulting from a crystalline component, and a difference between a spacing in a direction parallel to a principal surface of the substrate and a spacing of single crystal silicon is within the range of 0.2% to 1.0% with regard to the spacing of the single crystal silicon.
2. The silicon-based film according to claim 1, comprising a crystal of a columnar structure in a thickness direction.
3. The silicon-based film according to claim 1, wherein a percentage of a diffraction strength of (220) plane due to X-ray or electron beam diffraction is 30% or more of a total diffraction strength.

4. The silicon-based film according to claim 1,
which is formed by a plasma CVD method using a high
frequency.

5 5. The silicon-based film according to claim 4,
wherein the high frequency is not less than 10 MHz but
no more than 10 GHz.

10 6. A photovoltaic element comprising a
silicon-based semiconductor layer having at least one
pin junction on a support, wherein at least one i-type
semiconductor layer comprises the silicon-based film as
set forth in any one of claims 1 to 5.

15 7. The photovoltaic element according to claim 6,
wherein the silicon-based semiconductor layer is formed
on a substrate comprising at least a first transparent
conductive layer stacked on the support, and the first
transparent conductive layer has the surface shape
20 represented by the function f .

8. The photovoltaic element according to claim 6,
wherein the support is a conductive support.